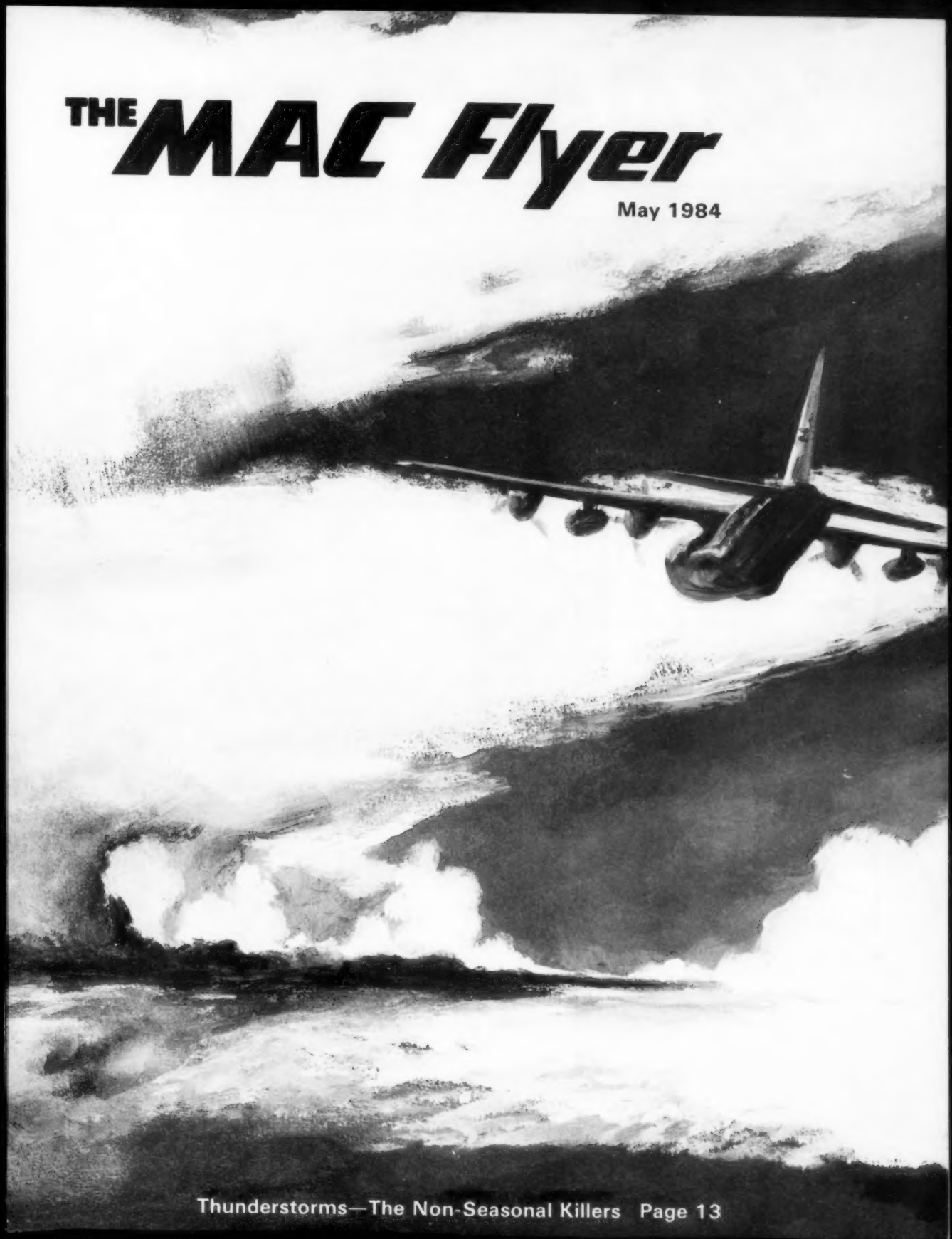
THE MAC Flyer

May 1984



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THE MAC Flyer

For Greater Safety in MAC Air Operations

MAY 1984 | MACRP 127-5 | VOL XXXI NO. 5

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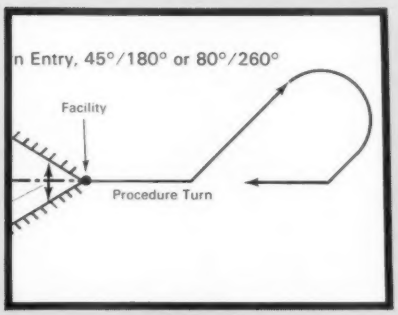

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I'm an Aircraft Commander and...

I Can Handle It!

by Maj. Philip A. White
4 MAS
McChord AFB, Washington

The Starlifter was enroute from the Azores to Charleston and this final leg of the mission wasn't routine. There had been a bad fire near the base at Lajes and on board were almost two dozen patients clinging to life by a thread and a prayer. MAC 60184 was now Air Evac 60184. The crew of six had been out on the road for almost two weeks, and hadn't planned on heading home with critically injured patients, the patients' immediate families and a medical crew.

Lt. Randy Store was in charge of the mission, one which he hoped would end in lives being saved. He thought about his new title, "Aircraft Commander," and realized it meant more than flying the plane. He was responsible for the success of the mission. But Store knew he could handle it. After all, he'd handled it before.

Right now, though, he didn't feel much in command of anything. The medical crew director (MCD) had just told him that one of the patients, a little four-year old girl, was having breathing problems and they would have to lower the cabin altitude. Otherwise, in her unstable condition, she could die. She had inhaled some super-heated smoke and probably some flames, and her lungs were badly injured. At the present altitude, she couldn't take in the oxygen she needed to live. Randy had a four-year-old daughter of his own and felt almost helpless just thinking about this little patient.

"Back to being an aircraft commander," Randy said out loud. "Copilot, contact Santa Maria on HF and try to get clearance for a lower altitude. Based on what the MCD told me, FL 310 should be fine. I'll check the radar for the buildups which were forecast to be in front of and below us. Engineer, check your fuel plot for FL 310 and let me know if we're going to have any problems."

Although the forecast was for isolated to few thunderstorms, the radar showed a line 150 miles in front of the Starlifter, and at least 200 miles long. Store adjusted the range, tilt and gain, and determined the tops to be about 30,000 feet. He knew if they were still building, he would have to pick his way through or around them.

Because of the early alert, the crew had started off tired, but Store knew he could handle it. He watched his copilot carefully. Since the right-seater was really new, Store didn't want to burden him with too much responsibility. There'd been no computer flight plans, so Store had done it all himself—manually. The copilot had been really slow in figuring the fuel planning. Since they were running late, Store hadn't had time to really double check all the work. He knew it should take about 78,000 pounds of JP-4 for the flight, so the 72.6 required seemed about right. He was grateful for the shortcuts he had picked up from other ACs. Their "ballpark" figures had helped in the past when he

Honorable Mention, 1983 MAC Flying Safety Writing Contest

used them. "I'm an aircraft commander and I can handle it," Randy thought. Then, the constant crackle from the HF brought the AC back to reality. "Copilot, how are you coming on the HF call?"

"Well, sir, I haven't been able to get through yet, but I'll keep trying," responded the copilot.

"Never mind. I'll handle that. You watch the radar and those storms. Remember, we aren't supposed to get any closer than 20 nautical miles."

Store tried the HF, but the reception was very poor. Finally, he made out Santa Maria and requested a clearance off course and descent to FL 310. Despite the static and poor reception, he copied the clearance, then relayed the good news to the right-seater. He was surprised at the copilot's response.

"Don't you think I should call them back to confirm the new altitude and route, then check with Lajes Airways for a weather update?"

"Thanks, but that won't be necessary. I've copied clearances in much worse conditions, and I know I copied correctly. Besides, we can see the returns on the scope. We have those patients to think about now."

And think about them he did. Compared to the burn victims and their situation, how could he complain about his trip? There had been the broken airplane with the elevator-feel light on the annunciator panel illuminating once on takeoff. There were loads that the Army *guaranteed* were correct. Two fuel trucks had 2,000 pounds less gas than requested, preventing the aircraft from being refueled soon enough to make an on time takeoff. But the lieutenant had managed to overcome all these problems, and he knew he could handle it this time also. He didn't think, though, that he could handle facing death the way some of his patients and passengers were having to do now.

Store glanced at the copilot and wondered why he hadn't started descending yet. "We're ready for descent anytime, co."

Again, the copilot's response surprised him. "But sir, it's still your airplane, isn't it?"

Lieutenant Store realized that he had never actually had a change of control of the aircraft, although he told the copilot about not getting closer than 20 nautical miles to the thunderstorms.

"I sure thought I told him it was his airplane. I guess no one was flying," Randy thought. "Pilot's airplane. We're out of three-nine-zero for three-one-zero."

The buildups in front of 60184 were no longer inactive cumulus clouds, but were building into a full-blown line of thunder bumpers. Now only 65 miles away from the storms, the Air Evac's ride was no longer smooth. Lieutenant Store extended the range on the radar to 300 miles but could see no breaks in the weather. It looked like diverting around it wouldn't be easy, so just slowing the descent to go over the tops might work. He wondered how much worse the flight would be for his patients in the back.

The ride got progressively bumpier, so Store slowed to turbulence penetration airspeed and started looking for a hole through the approaching weather. He adjusted the tilt and realized the storms were growing in height and depth. It was no longer a single line, but appeared to be a whole area of buildups. He had tried to pick his way through a squall line only once before when Kansas City Center radar was painting the whole weather system. Now he had to rely on himself, alone.

Again, he thought of the patients and asked to talk to the MCD. He explained the descent he had just completed and his plan for picking through the weather. It would probably get worse before it got better.

Even though it was really dark out, the lightning helped the crew see the buildups, and allowed the Starlifter to "E-and-E" in and out between the cells. A close watch of the radar showed maintaining 20 nautical miles from any cell was no longer possible, but Lieutenant Store had no other choice. It was too late to turn around.

A quick check of the INS distance and time showed just over four hours to Charleston. An uneasy feeling hit Store in the pit of his stomach and he rechecked the INS, his original flight plan and the fuel management log. Surprisingly, according to the log and flight plan, he should be only two and a half hours out. He quickly rechecked everything and found the problem. All his points were plotted correctly, but none of the ground speeds were even close to the INS readout. He quickly refigured the zero fuel line on the fuel log and realized he was in real trouble. They would have to climb and find a closer

suitable base than Charleston. Picking through the weather was using up the fuel faster than could be tolerated for more than a few minutes. If the weather was good enough, Langley AFB, Virginia, would be the closest suitable airfield.

The pilot talked to the MCD one more time and told her he would have to climb to save fuel. Luckily, all the patients were now stable and the climb would be all right. It took over an hour to work through the weather, and there were some pretty severe updrafts and downdrafts, but now it appeared they would have clear sailing. Now that they were on the back side of the storm, there was even a tailwind which helped make up some of the time they'd lost.

But a new problem was developing: both HFs were channelizing and wouldn't tune to any frequency. It would be another two hours or so before they'd be in VHF range of Washington Center.

During the next hour, Lieutenant Store planned the rest of the flight and reviewed the descent and approach to conserve fuel. Once the copilot was finally able to contact Washington Center, there was another surprise. Atlanta Center had issued an advisory for a possible missing C-141 Air Evac overdue into Charleston by almost two hours. Once they received their clearance, Store realized he was not flying at a cleared altitude or in cleared airspace. A mid-air out over the Atlantic would have ruined his whole afternoon.

He then realized what he had done wrong. He had tried to do everything by himself, figuring he was the aircraft commander and was the one who could handle it. He had made a mistake in the flight plan which then caused the copilot to use incorrect data in fuel planning. He hadn't really been given the clearance he asked for from Santa Maria, but instead had heard what he wanted to hear, without having another crewmember copy and confirm the clearance. He hadn't updated the weather enroute and was caught unprepared. Other than checking with the medical crew director, he hadn't conferred with the rest of the crew about anything.

Now he did just that. Everyone knew where they were going and how they would complete their diversion. Lieutenant Store was finally beginning to understand that being an aircraft commander was more than doing it all by himself. Much more. He had experts who could help him. That fact sunk in and was never forgotten while inspecting the aircraft after touchdown at Langley with about 5,000 pounds of fuel remaining. The HF antenna, the leading edge of the horizontal and vertical stablizers, and top part of the T-tail itself were badly hail damaged. Air Evac 60184 was very fortunate to have made it through the thunderstorms at all.

Later, Store and his crew sat at the snack bar at Langley and discussed the events of the past two weeks—and particularly the last 16 hours. As they shared their thoughts, each crew member came to a better understanding of crew coordination, especially Lieutenant Store, who finally realized that "*they* could handle it."

ABOUT THE AUTHOR

Maj Philip White graduated from OTS in 1969 and earned his navigator wings at Mather AFB, California, that same year. He completed pilot training in 1974 at Moody AFB, Georgia. After tours in Southeast Asia, he flew C-9s at Scott AFB, Illinois, and Clark AB, Republic of the Philippines, then served as an Air Intelligence Officer at Offutt AFB, Nebraska. He is currently assigned to the 4th MAS, McChord AFB, Washington.

Excellence In Airmanship

Left to right: Capt. Daran P. Goolsby, AC; 1st Lt. James D. Davidson, CP; SSgt. Domingo Alderete, LM; and 2nd Lt. Jon E. Ostertag, N. Not shown: TSgt. Ronald L. Barnard, FE.

Captain Daran Goolsby and crew, 772d Tactical Airlift Squadron, were returning to Dyess AFB from Little Rock AFB after completing a functional check flight (FCF) of one of their unit's C-130s. The aircraft had arrived at Little Rock with three engines shut down because of unrelated power and throttle malfunctions, a condition it had experienced earlier at an enroute stop. Following extensive troubleshooting and engine runs, the aircraft was cleared for the FCF, completed it without incident, and was cleared for the return flight to Dyess.

Enroute to their home station, Captain Goolsby and his crew kept a wary eye on the C-130's systems because of the previous problems, but all appeared to be operating normally. Some 70 miles east of Dyess, though, the crew began a descent during which they discovered numbers one and three engines would not advance above the flight idle power range when the throttles were moved forward. Troubleshooting the problem, they again advanced the numbers one and three throttles, but there was no corresponding power increase on either engine. With the two engines stuck in flight idle, they continued their descent and leveled off using numbers two and four. The crew declared an emergency and decided to fly a visual approach to expedite their recovery. The situation deteriorated further during the turn to final when the number four engine would not advance with a corresponding throttle movement. Now it, too, was stuck at flight idle.

The crew continued the approach with only the number two engine producing power above the idle range. As all four throttles were reduced to idle just prior to touchdown, the RPM on numbers one, three and four engines began to decay. The engineer, TSgt. Ronald Barnard, monitored the engine instruments, while the pilots moved all four engines into the ground idle range. The engineer confirmed all four engines were in ground idle when numbers one, three and four began to flame out. Captain Goolsby directed the engines be shut down and the copilot, 1st Lt. James Donaldson, feathered each as it passed through 80 percent RPM. The landing roll was completed with only number two engine as a controllable power plant. The superior airmanship, accurate assessment of the situation and outstanding crew coordination of Captain Goolsby and his crew overcame this extremely hazardous sit-

uation and prevented the possible loss of a valuable Air Force aircraft and its crew. Their actions are indeed worthy of the Excellence in Airmanship Award. Congratulations from *TMF*.

Editor's Note—After this incident, the aircraft was impounded and maintenance took fuel samples, physically inspected the fuel tanks, and removed all four engine fuel controls for depot teardown and inspection. The depot inspectors were able to determine that contaminated fuel was the culprit. When the contaminated fuel entered the fuel controls, the suspended solids eventually caused the intermittent malfunction of the metering valves which control the flow of fuel to the engines. Due to multiple refueling locations prior to the incident, the source of the contaminated fuel could not be determined.

Majors Charles Jordan and Kurt Wisecarver, 1st Military Airlift Squadron, were on a routine instructor upgrade mission in their C-6A, practicing transition at several airfields in the vicinity of Andrews AFB. After completing their fourth touch-and-go landing at Frederick Municipal Airport, Maryland, they raised the gear. Unknown to them, though, the right main gear wheel assembly departed the aircraft during the gear retraction. The pilots quickly became aware of the dropped wheel when the airport manager called on UNICOM and advised them that something had fallen off their aircraft. A quick visual inspection by the crew confirmed the loss of the wheel assembly, and they returned to Andrews AFB to prepare for landing.

Left to right: Maj. Charles G. Jordan, Jr., IP; and Major Kurt J. Wisecarver, FP.

Once in the Andrews area, the crew discussed the situation with a factory representative and a unit stan/eval pilot. Since the gear could not be retracted, the pilots decided to land with both the left main and nose gears extended, and using the strut of the right main gear. They planned a full-flap approach to minimize ground roll and decided to feather the right engine on short final to minimize prop damage when the right wing was lowered to the runway. The crew also removed the right over-wing escape hatch in case the primary exit door was jammed during the landing. After burning their fuel down to approximately 300 pounds, to minimize the possibility of fire after landing, they began their approach.

The pilots flew a flawless single-engine approach and touched down on the left side of the Andrews runway with the right strut directly over the foamed portion of the runway. Controllability was very good and Major Jordan was able to hold the right strut off the runway until approximately 50 knots. Once the strut was on the ground, the crew used a combination of reverse thrust and brake to maintain ground track. At about 25 knots, the aircraft pulled slightly to the right of the foam and came to a stop 5000 feet from the approach end. Both pilots egressed uneventfully. Damage to the aircraft was limited to the right strut assembly, main gear tire and a dent in the flaps caused when the wheel departed the aircraft. Their calm professional handling of this potentially catastrophic inflight emergency clearly qualifies Major Jordan and Major Wisecarver for the Excellence in Airmanship Award. Congratulations from *TMF*.

ICAO Procedure Turns

Do the terms "base turn, 45°/180°, 80°/260° or racetrack" mean anything to you? Well, if you fly anywhere besides the good old USA, they should be fairly routine terms. For you CONUS-only aeronauts, or those of you who've been desk-bound for awhile, what we're talking about are the updated ICAO (International Civil Aviation Organization) terms and procedures for flying procedure turns and other course reversal maneuvers. Although these procedures apply only in areas outside FAA control (basically, FAA jurisdiction applies only to the United States and its territories), it's more than likely that sometime soon in your flying career you'll be flying one.

History

In late 1982, ICAO published extensive changes in their instrument approach design criteria. Obstacle clearance and protected lateral airspace are based on flying specific, associated maneuvers. Because of this, and the fact that our instrument manual, AFM 51-37, does not adequately cover the maneuvers, HQ USAF directed that Air Force aircrews become familiar with and use the ICAO procedures when flying in areas outside FAA control. MAC, then, had all pilots and navigators attend a training course on these new maneuvers. Now on with the review.

Some Basics

ICAO recognizes four distinct methods of performing a course reversal associated with an instrument approach procedure (IAP). These are the 45°/180° procedure turn, 80°/260° procedure turn, base turn and racetrack. Before we look at each, though, we need to look at some procedures common to all ICAO reversal maneuvers.

● **Entry.** Except for base turns and racetracks, a pilot must enter a reversal procedure from a track aligned within ± 30° of the outbound reversal track. (Figure 1.) For

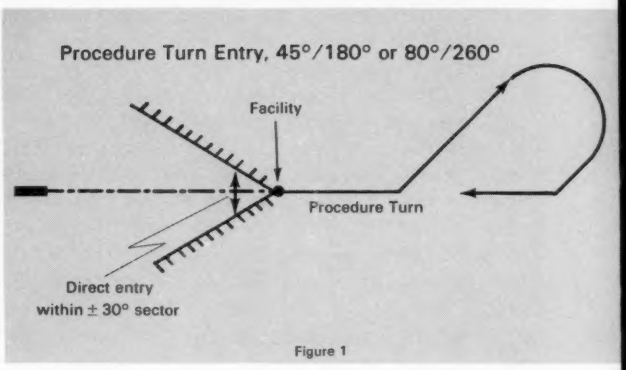


Figure 1

base turns, if the ± 30° entry sector doesn't include the reciprocal of the inbound track, the entry sector is expanded to include it. (Figure 2.) If your aircraft's arrival track is not within the entry sector, obtain ATC clearance to align the aircraft for the entry. Racetrack entries are similar to holding entries, with some differences we'll cover later.

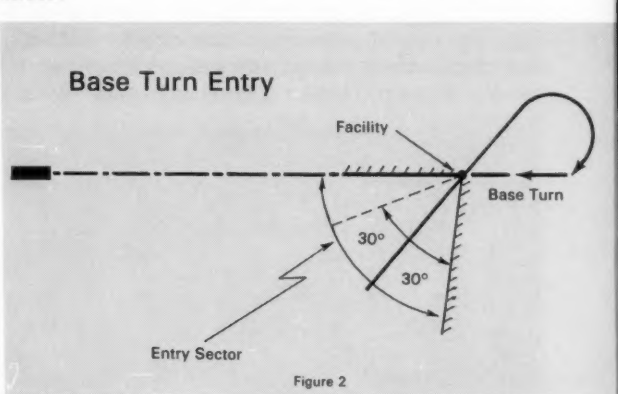


Figure 2

● **Timing.** Some course reversal maneuvers require timing to comply with an overall "remain within" distance depicted on the approach plate. Others may specify an outbound time to a point where the actual reversal is to begin. When starting the approach, time outbound from over or abeam

(whichever is applicable), the facility or fix. If you're unable to determine the abeam position while in a turn, start timing after completing the turn.

● **Descent.** A descent can be depicted at any point along the course reversal. If a descent is depicted on an IAP, start descent when abeam or past the IAF and on a parallel or intercept heading to the depicted track. Except for initial descents at the IAF, pilots must be established on a segment of the IAP before beginning a descent to the altitude associated with that segment.

● **Speeds.** Before reaching the IAF, crews should reduce airspeed to maneuvering airspeed. (Use holding airspeed if maneuvering airspeed isn't specified for your aircraft.) However, don't exceed the speeds (listed below) for your category of aircraft without the approval of the air traffic control agency. But remember, additional speed restrictions may be shown on the IAP.

Category	Max Speed
A	110 KIAS
B	140 KIAS
C	240 KIAS
D, E	250 KIAS

Now, let's take a look at the specific procedures.

Procedure Turns

While there are two types of procedure turns, namely the 45°/180° and the 80°/260°, both are essentially the same. The difference is only in the turn actually used to reverse course. Both consist of flying an outbound track to a specified fix, then flying the specific turn maneuver. The turn fix depiction may vary. DME, timing from the IAF, or some other fix, such as being over a navaid, may be used.

Presently there are some charting variations for the exact turn method to be used. For the 45°/180°, you may see the "barb" or a procedural track type depiction. We've shown the common variations in figure 3.

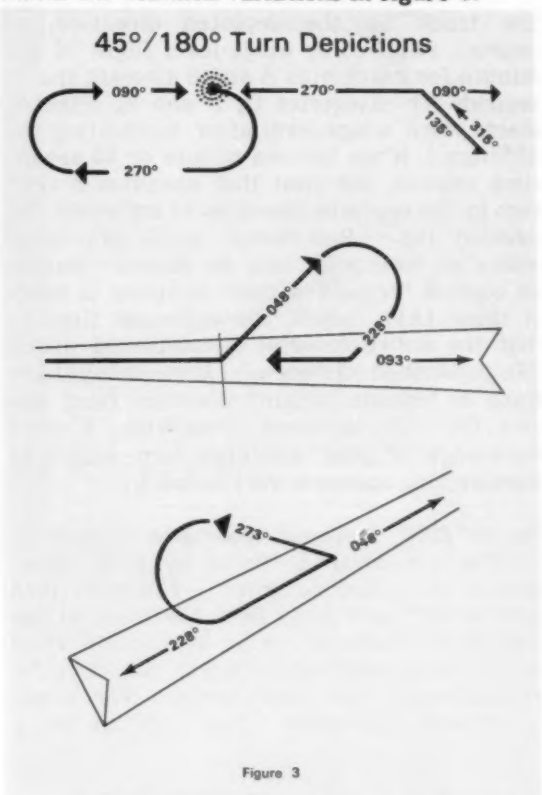
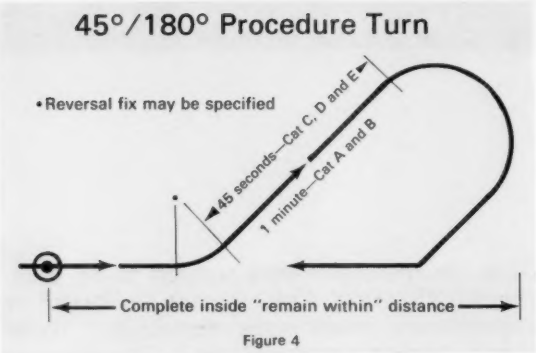


Figure 3

The 80°/260° turn is always shown as a procedural track with the initial turn indicated as an 80° turn from the outbound track. The key to the type of turn in all cases is the number of degrees shown from the outbound track.

The 45°/180° Reversal Procedure (Figure 4.)

This maneuver consists of intercepting and flying the outbound track to the turn point. Then a 45° turn is made away from


45°/180° Procedure Turn
•Reversal fix may be specified
45 seconds—Cat C, D and E
1 minute—Cat A and B
Complete inside "remain within" distance
Figure 4

the track (in the depicted direction, of course), followed by wings-level flight of one minute for categories A and B aircraft and 45 seconds for categories C, D and E. (Timing starts when wings level after completing the 45° turn.) When the one minute or 45 second time expires, the pilot then executes a 180° turn in the opposite direction to intercept the inbound leg. Remember, there are cases where no turn point may be shown. Rather an overall "remain within" distance is used. In these IAPs, adjust the outbound time so that the entire reversal is completed within the prescribed distance. Also, many IAPs state a "remain within" distance from the turn fix. As in many maneuvers, a good knowledge of your aircraft's turn radius at maneuvering speeds is very helpful.

The 80°/260° Reversal Procedure (Figure 5)

This maneuver is flown by first intercepting the outbound track. The pilot then does an 80° turn away from the track at the turn point, followed by an immediate 260° turn in the opposite direction to intercept the inbound track. One note, though. This is not an optional procedure. You may not use a 45°/180° in its place. Likewise don't perform an 80°/260° when a 45°/180° is called for on the IAP.

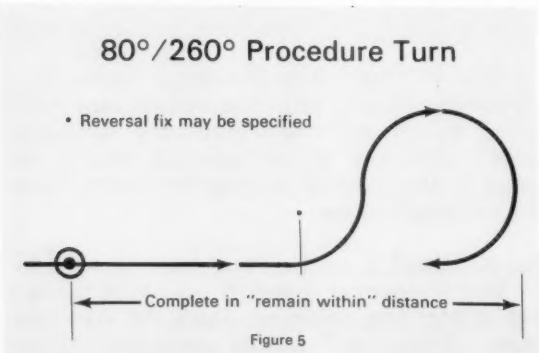


Figure 5

The Base Turn (Figure 6)

Begin this maneuver by intercepting the specified outbound track and timing from the facility, or by proceeding to a specified fix. This is followed by a turn to intercept the inbound track. This maneuver is also not optional and is depicted as a procedural track.

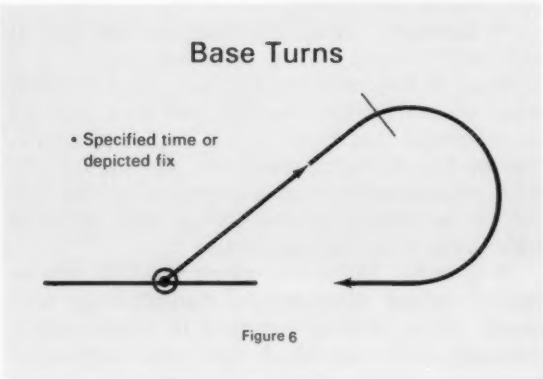


Figure 6

The Racetrack (Figure 7)

This maneuver is essentially a holding pattern with outbound leg lengths of from one to three minutes, specified in 30-second increments. Entry is similar to procedures for a holding pattern, with the following exceptions:

- Teardrop offset will not exceed 30° from the inbound course.
- Teardrop entry is limited to one minute 30 seconds wings-level time on the teardrop track. After that, turn to parallel the outbound track for the remainder of the outbound time. If the outbound time is only one minute, the time on the teardrop track should be one minute as well.
- Regardless of the entry procedure used, don't return to the facility without first intercepting the inbound track.
- When airspace limitations dictate, entry into the racetrack may be restricted to specified routes. If such restrictions apply, entry tracks will be shown on the IAP.

The racetrack may also be specified as an alternative to the 45°/180°, 80°/260° and base turn procedures. In this case, the approach plate will contain the appropriate

depiction and normally the words "Alternate Procedure." Pilots should be prepared to execute either procedure. Prior to an approach for which an alternate procedure is depicted, *verify* with ATC which procedure they expect you to fly.

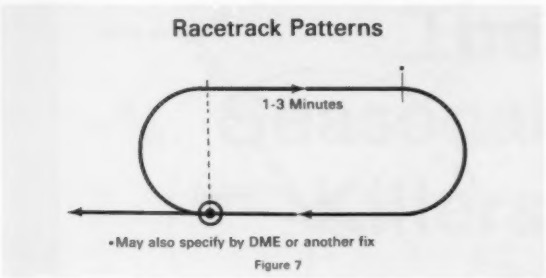


Figure 7

A final word on accuracy. We've reproduced the chart below (Figure 8.) to show relative airspace for procedure turns. The tracks are based on an indicated airspeed of 240 knots and a 30° bank angle with no wind. Using one minute outbound before starting the turn (placing you at the 4 nm point), you will remain within 10 nm. The dashed line shows that a 30° teardrop track displaces you significantly farther from the inbound course, if flown to the farthest point to stay within a 10 mile "remain within" distance, for example. Since an ICAO design offers less lateral airspace, the importance of being on track is clear.

Admittedly, this has been a brief overview of ICAO reversal procedures, but we hope it will spur you into more study of the applicable procedures. Remember also that there are some national design variations. However, these basic terms and procedures will help you with any of them, along with the old maxim of a thorough review of the IAPs during preflight planning.

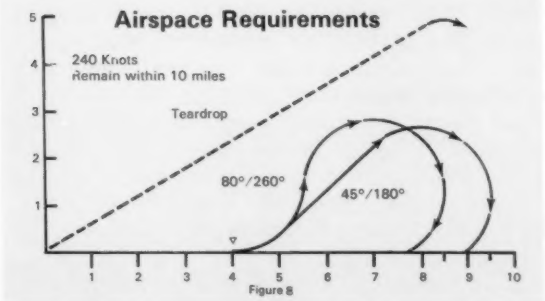
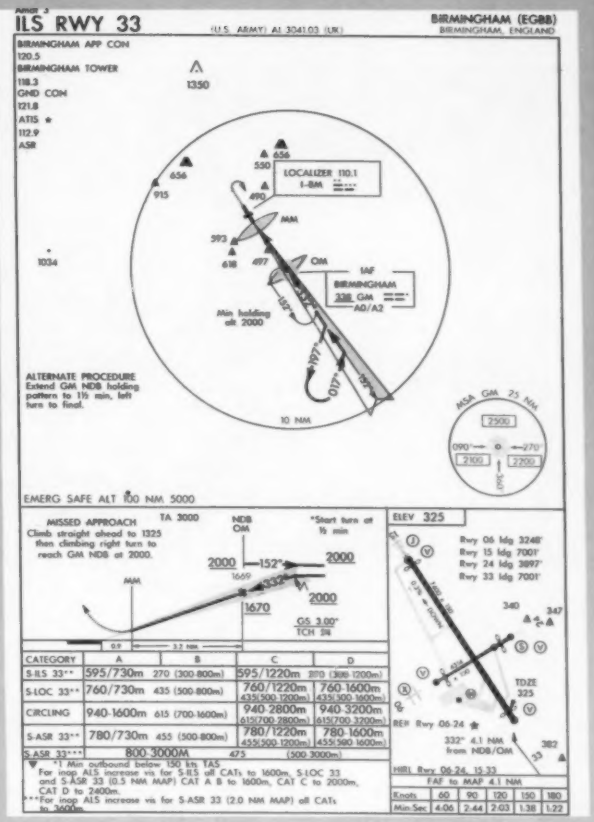


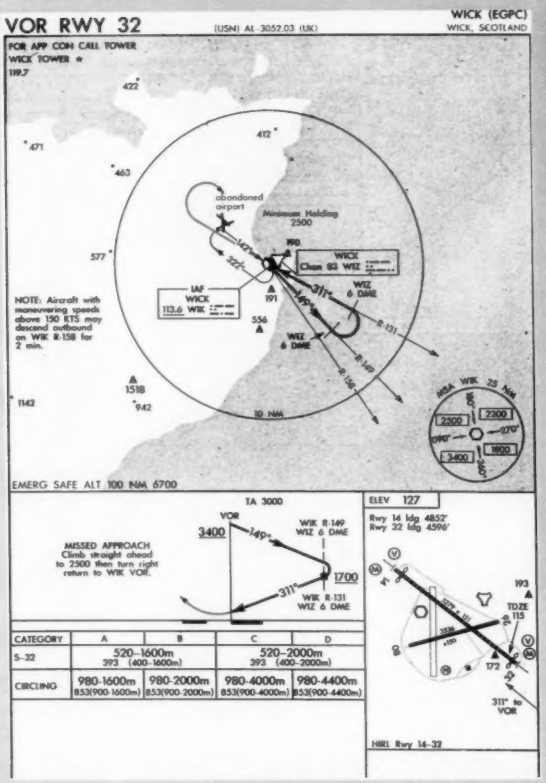
Figure 8


ILS RWY 33
BIRMINGHAM (EGBB)
BIRMINGHAM, ENGLAND
BIRMINGHAM APP CON
120.5
BIRMINGHAM TOWER
118.3
GND CON
121.8
ATIS
112.9
ASR
1350
LOCALIZER 110.1
I-BM
IAF
BIRMINGHAM
338 GM
AD/A2
Min holding alt 2000
ALTERNATE PROCEDURE
Extend GM NDB holding pattern to 1½ min, left turn to final.
10 NM
MSA GM 25 NM
EMERG SAFE ALT 100 NM 5000
MISSED APPROACH
Climb straight ahead to 1325 then climbing right turn to reach GM NDB at 2000.
TA 3000
NDB
OM
*Start turn at ½ min
GS 3.00°
TCH 38
ELEV 325
Rwy 06 ldg 3248'
Rwy 15 ldg 7001'
Rwy 24 ldg 3897'
Rwy 33 ldg 7001'
TDZE 325
REF Rwy 06-24
332° 4.1 NM from NDB/OM
HIRL Rwy 06-24, 15-33
FAF to MAP 4.1 NM
CATEGORY | A | B | C | D
S-ILS 33** | 595/730m 270 (300-800m) | | 595/1220m 270 (300-1200m) |
S-LOC 33** | 760/730m 435 (500-800m) | | 760/1220m 435(500-1200m) | 760-1600m 435(500-1600m)
CIRCLING | 940-1600m 615 (700-1600m) | | 940-2800m 615(700-2800m) | 940-3200m 615(700-3200m)
S-ASR 33** | 780/730m 455 (500-800m) | | 780/1220m 455(500-1200m) | 780-1600m 455(500-1600m)
S-ASR 33*** | 800-3000M 475 (500-3000m)
*1 Min outbound below 150 kts TAS
For inop ALS increase vis for S-ILS all CATs to 1600m, S-LOC 33 and S-ASR 33 (0.5 NM MAP) CAT A B to 1600m, CAT C to 2000m, CAT D to 2400m.
***For inop ALS increase vis for S-ASR 33 (2.0 NM MAP) all CATs to 3600m
Knots | 60 | 90 | 120 | 150 | 180
Min-Sec | 4:06 | 2:44 | 2:03 | 1:38 | 1:22

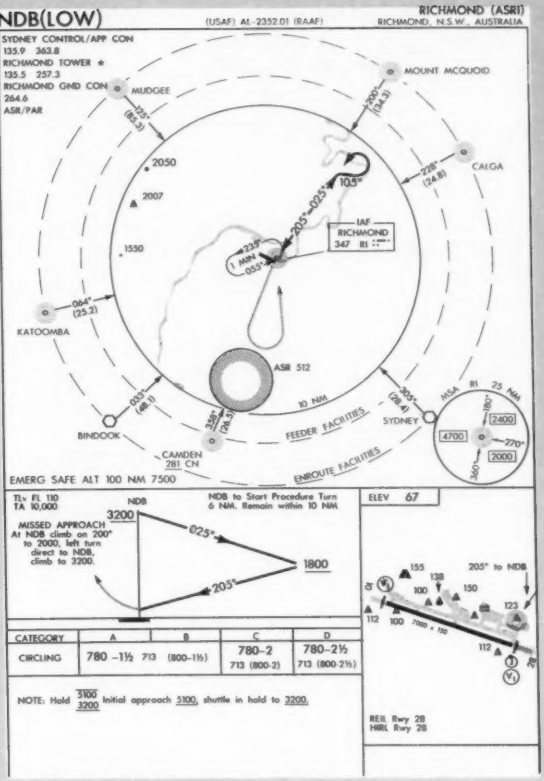
This IAP shows the use of time outbound for starting the 45°/180° maneuver. Note that the times are different in this case since they depend on true airspeed. Also an "alternate procedure" is available, in this case a racetrack.

(Continued on next page)

(Continued from page 11)



This IAP shows a base turn with an arrival holding pattern provided for entry alignment. The turn point uses DME for initiating the inbound turn. Note that aircraft maneuvering above 150 knots may descend on WIK R-158 with the turn point defined by time—another standard method for defining turn points. By the way, the R-158 is provided to give a smooth roll out on final for the faster types.



This IAP depicts an 80°/260° procedure turn. An arrival holding pattern provides entry alignment, if required. (Always ensure you have ATC clearance for the holding airspace if you need it.) The pilot will need to adjust outbound timing to start the 80°/260° at 6 nm from the RI NDB. The entire procedure must be completed within 10 nm of RI. Another interesting note is the term "shuttle in hold." This means descend in the holding pattern. The 5,100-foot minimum initial approach altitude applies unless you're otherwise cleared.

A multitude of hazards make...

Thunderstorms—The Seasonal Killers

Do you think you're one of those fearless fliers who knows everything there is to know about thunderstorm avoidance? Have you read, heard, seen or been exposed to every conceivable item of knowledge on the subject of severe storms? If you think this way, you could very well be the next recipient of a lightning strike, hail damage, or a dose of extreme turbulence.

Take a few moments to consider that MAC experienced 20 lightning strike incidents last year. The total cost of those miscues was approximately $190,000. (The cost doesn't take into account mental anguish, gray hairs, etc.) Speaking from experience (the author's aircraft suffered two lightning strikes in one week), sustaining a lightning strike in the air is something you never want to experience, much less repeat!

In case you're either too young to have been around much actual weather, or just need a memory refresher, ***TMF*** is going to take a look at the hazards of "cumulobumpus." Step right up. You might even learn a thing or two!

Thunderstorms

The hazard most commonly associated with thunderstorms is lightning. Like Mark Twain said many years ago: "Thunder is good. Thunder is impressive. But it is *lightning* that does the work!" If you've ever approached a single cell or a squall line on a "dark and stormy night," the first thing you'll probably see is lightning and you'll probably see it well before the storm shows up on radar. But lightning *is* dangerous. Out of 15 selected fatal commercial aircraft mishaps from 1940 to 1977, lightning was the cause factor in five of them, accounting for 243 deaths. Two of those five crashes were thought to be caused by fuel ignition through the fuel venting system when lightning struck. Finally, if plain, ordinary run-of-the-mill lightning bolts aren't enough, some pack the power of a small nuclear weapon. Termed "superbolts," they occur in areas where small storms don't form often enough

to relieve the electric tension, so the clouds literally store their electricity for one big blast. How big? How about up to 10 trillion watts in 1/10,000 (0.0001) of a second, or more than all the utilities in the world could generate!

Turbulence

Anyone ever caught inside a thunderstorm will readily attest to the turbulence they found there. But do you know where you'll encounter the most turbulence? Within the cloud itself, you'll find the strongest turbulence in the shear between updrafts and downdrafts. That shear differential has been measured in excess of 300 knots!

Outside the cloud, shear turbulence often reaches several thousand feet *above* and up to *20 miles laterally* from a storm. (That's just one reason for the 20-mile "keep-away" distance.)

Icing

Thunderstorms contain great amounts of moisture, and updrafts cause this moisture to be lifted very high, very quickly, where it becomes supercooled. When the temperature in the upward current cools to about -15°C, much of the supercooled water vapor becomes ice crystals. But that remaining supercooled water freezes on impact with an aircraft, and the resulting clear icing can occur at any altitude above the freezing level. At high altitudes, icing may be rime or a murderous combination of clear *and* rime. The abundance of supercooled water makes clear ice accumulation very rapid between 0°C and -15°C.

Hail

Hail competes with lightning and turbulence as the greatest hazard to aircraft. Eventually, all hailstones yield to the force of gravity and fall from the storm cloud. But just because a T-storm may not be producing hail that reaches the ground, you should still assume the worst and anticipate possible hail at any level, especially under the anvil. The damage hail can inflict upon your aircraft includes shattered cockpit windows and radomes, extensive fuselage damage, and engine failure due to hail ingestion!

Tornadoes

Asking which is worse, tornadoes or hurricanes, is like asking how you'd like your poison. Once, the author observed a "hook" form on an airborne radar scope indicating a potential tornado, but luckily there was no trouble in avoiding it. Those on the ground, however, weren't so lucky. The hook on the radar scope turned out to be a full-blown, killer tornado that ripped up a good portion of Texas real estate.

Basically, a tornado is a rotating vortex of wind, with winds inside the swirling mass sometimes exceeding 200 knots. The strong winds gather dust and debris, and the low pressure generates a funnel-shaped cloud extending downward from the cloud base.

Tornadoes occur with both isolated, individual storms, and along squall lines. Wandering into a tornado vortex is almost certain to cause structural damage to an aircraft. But the big danger lies in trying to penetrate a thunderstorm and then getting inadvertently caught in an internal vortex. Doppler radar has identified vortices at 10,000 to 20,000 feet, 30 minutes prior to tornadoes showing up underneath the cloud. It's just one more reason not to foolishly attempt to penetrate a T-storm.

Flying Under T-storms (and other ridiculous notions)

Along about now, you may be thinking that enough's enough. Could it do any harm to fly under them? You betcha, red rider. Consider that gust fronts underneath a storm can extend 10 to 15 miles in front of it, and exceed 120 knots! Those strong yet variable winds often create severe turbulence which wouldn't be much fun, especially close to the ground. The same turbulence considerations which apply to flight at high altitudes near thunderstorms apply to low levels as well.

And don't think about flying over the top, either. Flight data shows a relationship between turbulence above storm tops and the speed of the upper tropospheric winds. When winds at the top of the storm exceed 100 knots, significant turbulence may be experienced as much as *10,000 feet above* the cloud tops.

Storms can grow very fast, too. During severe storm situations, radar echo intensities may grow by a factor of ten each minute, and cloud tops by 7,000 feet per minute. Therefore, there's no flight path through such a field of strong or very strong

storms separated by 20-to-30 miles or less that can be considered to remain free from severe turbulence.

Radar is an excellent ***aid*** in avoiding storms, but there shouldn't be one crewmember in MAC who needs to be reminded of the tragedy of the DC-9 that attempted to penetrate a line of storms near Atlanta several years ago. Airborne weather radar is a valuable tool, but its principal use is as an indicator of storm locations for avoidance purposes while enroute! (See Airborne Weather Radar, *TMF*, April 1984.)

As the old saying goes, into every life a little rain must fall. But when that rainshower turns into a real gulley-washing, raining-cats-and-dogs downpour, and you're caught in the middle of said storm, then it becomes an entirely different matter—one of life or death.

The best advice is this: Don't get suckered in by old wives tales, popular misconceptions and gross ignorance. Take the time to know your enemy—Thunderstorms! Then avoid them like the plague!

Some DO's and DON'Ts

—Don't land or take off in the face of an approaching thunderstorm.
—Don't attempt to fly under a T-storm. Turbulence and wind shear await.
—Don't fly into cumulus-type clouds without an airborne radar.
—Do follow the guidance in your appropriate MACR 55-XXX regulation for avoidance criteria.
—Remember, frequent and vivid lightning or severe turbulence could indicate a severe storm nearby.
—Regard any T-storm as extremely hazardous!

If by some "stroke" of extremely poor luck you're caught between the proverbial rock and a hard place, and you have to penetrate a thunderstorm, here's how to save yourself.

—Lock your shoulder harness and ensure everyone is strapped down.
—Doublecheck your cargo restraints if you have time.
—Plan and hold a course to take you through a storm in absolute minimum time.
—To avoid the most critical icing, establish an altitude below the freezing level. This also helps reduce the potential of a lightning strike.
—Verify pitot heat and other anti-icing systems are on and operating.
—Establish flight manual speeds and power settings for turbulent airspace or T-storm penetration.
—Turn on the cockpit thunderstorm lights.
—If your aircraft is on auto-pilot, disengage the altitude hold and speed hold modes.
—Tilt your airborne radar up and down occasionally. This will permit you to detect T-storm activity at other altitudes.

When you inadvertently find yourself inside a storm cloud, adhere to the following techniques to minimize the risk:

—Keep your eyes on your instruments. Looking outside can increase your chance of temporary blinding by a lightning flash.
—Don't change power settings.
—Maintain a constant attitude. Don't try to chase the altimeter. That will only increase stress on your aircraft.
—Don't turn back once you're in a T-storm. A straight course is most often the quickest way through. Additionally, trying to maneuver will only increase the stress on the airframe.

Specific Guidance

The most specific guidance on the subject of thunderstorm avoidance comes from AFR 60-16. *There is no peacetime mission that requires thunderstorm penetration.* MAC types get the following guidance from their respective MAC 55-XXX series regs.

Plan all missions to avoid areas of forecast or known severe weather including icing or severe turbulence which may exceed aircraft limitations. Avoid thunderstorms and cumulonimbus clouds using the following criteria:

(1) FL 230 and above: 20 nm.
(2) Below FL 230: 10 nm.
(3) Tactical operations. Below FL 230: five NM. Outside air temperature must be above 0°C at flight altitude. Avoid gust fronts and winds preceding a rapidly moving thunderstorm.

Remember, your Dash-One and your MACR 55-XXX regs contain specific guidance for keeping away from these seasonal killers. Heed their warnings and keep from becoming another mishap statistic.

Adapted from FAA Advisory Circular 00-24B

CRAF—Our Partners in Airlift

This issue begins a new *TMF* feature saluting the airlines and aircraft which support the CRAF (Civil Reserve Air Fleet). What better way to start than with the Boeing 747, the first of the giant jetliners.

Design of the B-747 began in the early 1960s when market research indicated the need for an airliner with greatly increased

passenger and cargo carrying capabilities. On 30 September 1968, the first 747 rolled out of the Boeing factory and the age of the "jumbo jet" was upon us. After a first flight on 9 February 1969, the 747 was quickly certified and entered scheduled airline service in January, 1970.

The 747 is offered in three basic configurations: all-passenger, mixed passenger and cargo, and all-freighter. In the freighter or convertible versions, the aircraft's large interior dimensions allow loading of oversize cargo (defined as palletized cargo exceeding 104 inches in width, 84 inches in length, or 96 inches in height), a feat impossible on most other standard commercial aircraft. It cannot, however, accommodate outsize cargo, which is currently carried only by the Lockheed C-5. The first 747 freighter went into service in 1972 and immediately began carrying cargo loads of more than 200,000 pounds. A convertible version was introduced in 1973, and by 1983 the 747 family included nine different models.

The Air Force currently operates 747s designated the E-4B Advanced Airborne National Command Post. Additionally, the New York Air National Guard's 105th Military Airlift Group is scheduled to receive three 747s (designated C-19A) during 1984.

The commercial 747s play a major role in the CRAF with nine airlines (whose logos appear above) volunteering 147 of these highly productive aircraft. Its impressive oversize cargo and passenger carrying capabilities make the Boeing 747 a vital element in the augmentation of our nation's airlift forces. ★

Boeing 747-200C/F Specifications

Length	231 feet 10 inches
Wing Span	195 feet 8 inches
Height	63 feet 5 inches
Max T/O Weight	833,000 pounds
Max Cargo Weight	250,000 pounds
Cruise Speed	550 mph plus
Range	5,500 statute miles (150,000 pound payload)

Dear Doc

Hypertension and the Crewmember

by Henry D. Nichamin, M.D.
and
Stanley R. Mohler, M.D.

Adapted from Cathay Pacific *Kai Talk*

Background

Uncontrolled hypertension (also known as high blood pressure), can prematurely end a crewmember's career. Hypertension is defined as a resting blood pressure that exceeds certain defined limits. These limits are based upon levels that have been shown to be directly associated with increased risks of coronary artery disease, stroke and other serious conditions. But what exactly are the limits we're talking about?

The Federal Aviation Administration (FAA) regulatory limits in Part 67 of the Federal Aviation Regulations (FARs) for hypertension for first-class medical certificates are shown in Figure 1. For second and third-class medical certificates, the FAA has issued supplemental non-regulatory guidance.

Systolic and Diastolic Pressures

Each heartbeat leads to a maximum pressure of ejection (systolic pressure), followed by a fall to a lower pressure (diastolic pressure), at which point another heartbeat again raises the pressure. The person taking the pressure listens over the brachial artery for "korotkoff" sounds, the first faint tapping heard as the pressure cuff deflates, as an indication of the systolic pressure.

The sounds increase as the cuff deflates further and then begin disappearing. Muffling abruptly occurs, followed by sound disappearance. This latter is considered to be the disastolic pressure. The pressures are recorded in millimeters of mercury, with the systolic pressure on top, and the the diastolic on the bottom. For example, 130/80.

Blood Pressure Variation

It's normal for blood pressure to vary with mood and activity. It's also common for those who have a high degree of emotional investment in flying to have a somewhat elevated blood pressure at the time of the flight physical examinations. These persons are referred to as hyper-reactors. This con-

Age Group	Max Readings Diastolic (reclining in mm/Hg)		Adjusted Maximum Readings (Reclining in mm/Hg)[1]
20-29	140	88	
30-39	145	92	155/98
40-49	155	96	165/100
50+	160	98	170/100

Blood pressure limits as defined in FAR, Part 67, for first class medical certificates. Part 67 doesn't address second and third-class medical certificates, but supplemental nonregulatory upper limits are set by the FAA as 170/100.

[1]For an applicant at least 30 years old whose reclining blood pressure is more than the maximum reading for his age group and whose cardiac and kidney conditions, after complete cardiovascular examination, are found to be normal.

Editors Note; There is only one limit for active fliers in the USAF—140/90!

dition has been known to flight surgeons since well before WWII.

Treatment vs. Non-Treatment

Individuals with sustained hypertension should definitely initiate certain countersteps. Normal blood pressure is considered to be in the 120/80 range. Systolic pressures of 140 or greater, and diastolic pressures of 90 or greater place an individual in the hypertensive range. Medically speaking, increased cardiovascular disease and premature death begin occurring at all levels of elevated blood pressures, worsening as the levels increase. Treatment steps include, as applicable:

- Stop smoking.
- Lose excess weight.
- Regular, sensible exercise.
- Limit alcohol intake to that specified by your physician.
- Learn to relax!
- Cut down on salt and cholesterol.
- If necessary, get help from from your flight surgeon.

Inaction will encourage the development of hypertension, along with the potential complications that may occur—stroke, heart attack, paralysis, and death. Persons who have a family history of hypertension, coronary artery or other vascular disease should be especially careful to practice the preventive measures described above.

Complications of Uncontrolled Hypertension

Elevated, sustained blood pressure levels will lead to extra stress on the heart, resulting in abnormal cardiac enlargement. The smaller "muscular" blood vessels (arterioles) will tend to become permanently blocked, further sustaining hypertension.

Coronary artery fat deposits (cholesterol) escalate, leading to advanced arteriosclerosis, or hardening of the arteries. Kidney blood vessel damage develops. Myocardial infarction (heart attack), stroke and congestive heart failure are three very possible complications, all associated with disability and premature death.

Medication While Flying

The FAA doesn't permit any medication for treating hypertension that will likely cause drowsiness or otherwise cloud the mental processes, or block the blood pressure sustaining reflexes. In this latter category, the concern is that, in maneuvers that exceed one G, the treated person may black out. The FAA permits active crewmembers to use certain diuretics and "beta-blocker" drugs to control hypertension, depending upon individual circumstances.

The Air Force, on the other hand, permits only two drugs (both diuretics) to be used in the treatment of hypertension in crewmembers. Use of these drugs requires a MAJCOM waiver. The USAF also requires careful monitoring of the patient, including tests of blood electrolytes, to detect possible side effects.

Conclusion

Awareness of the possible undetected presence of hypertension is important and should be followed by periodic checkups. The practice of common-sense preventive measures is the second line of defense against hypertension. The third line of defense is consultation with a cardiologist where indicated, followed by the appropriate treatment. The steps we mentioned will help assure, in most cases, a long, safe flying career!

Flying Hour Milestones

10,000

Lt Col Bob W. Wright, 53 MAS
Maj Larry L. Farmer, 3 MAS
Maj Paul A. Petek, 30 MAS
SMSgt Lester E. Finney, 9 MAS
SMSgt David R. Tabor, 55 WRS
MSgt Lewis H. Fountain, 335 MAS
MSgt Dennis C. Gill, 305 ARRS
MSgt Ronald A. Koplitz, Det 4, AWS
TSgt Douglas H. Bryan, 158 TAS

5,000

Col Clifford A. Hodge, 316 TAG
Col David D. Wilson, 316 TAG/CC
Lt Col Alan M. Boyce, Det 1, 1402 MAS/CC
Lt Col James A. Butler, Det 1, 1402 MAS
Lt Col Hugh T. Garner, Det 1, 1402 MAS
Lt Col Stephen J. Kish, Jr., 130 TAS
Lt Col John F. Mauss, 21 TAS
Lt Col Rodger A. Smitley, 317 TAW
Lt Col Paul W. Smith, Jr., 144 TAS
Lt Col Kenneth M. Taylor, Jr., 144 TAS
Lt Col Jim E. Wyatt, Det 1, 1402 MAS
Maj Gary L. Anderson, 144 TAS
Maj Steve R. Dunkin, 21 TAS
Maj Philip B. Evans, 144 TAS
Maj Lewis M. Glauner, 30 MAS
Maj John M. Holovar, 774 TAS
Maj Robert E. Shepherd, 144 TAS
Maj Gary J. Solberg, 9 MAS
Capt Ernest E. Butler, Jr., 774 TAS
Capt Thomas E. Cornell, III., 11 AAS
Capt James A. Danielik, 41 MAS
Capt William C. Hale, 11 AAS
Capt Steven B. Jansen, 21 TAS
Capt Thomas E. Stroup, 701 MAS
Capt John R. Svela, 1402 MAS
Capt Richard H. White, 316 TAG
SMSgt Charles D. Arvin, Jr., 337 TAS
SMSgt John M. Fausch, 316 TAG
SMSgt Richard Tannis, 6 MAS
SMSgt Hugh R. Zimmer, 30 MAS
MSgt Juan Benitez, 102 ARRS
MSgt Frank Brashears, 9 MAS
MSgt Cleveland Croswell, 6 MAS
MSgt Roger D. Flory, 305 ARRS
MSgt Edward J. Hamrich, II., 700 TAS
MSgt Robert L. Hermes, 55 WRS
MSgt Robert A. Herreros, 102 ARRS
MSgt Charles A. Hunt, 21 TAS
MSgt Rocco J. Oliveto, 102 ARRS
MSgt Donald T. Oswald, 144 TAS
MSgt James L. Rivers, 316 TAG
TSgt William Burchette, 707 MAS
TSgt Thomas V. Dzwonkus, 337 TAS
TSgt Coleman G. Eiche, 6 MAS
TSgt William E. Fisher, Jr., 335 MAS
TSgt Edgar B. Harris, 30 MAS
TSgt Charles T. Radabaugh, 158 TAS
TSgt Fredrick Willison, 21 TAS
TSgt Herbert D. Wright, 6 MAS
SSgt John W. Arseneault, 30 MAS
SSgt Russell H. Yoder, II., 707 MAS

2,500

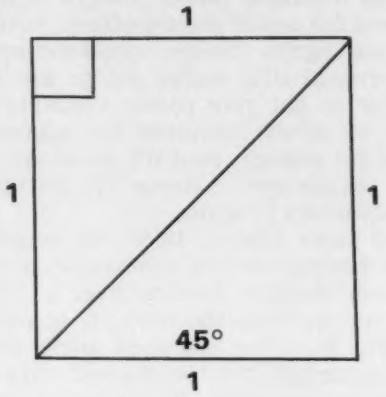
Lt Col John Miller, 102 ARRS
Lt Col Ronald Scott, 102 ARRS
Maj Michael D. Gregersen, Det 11, 39 ARRW
Maj Arthur Rivolo, 102 ARRS
Capt John Flanagan, 102 ARRS
Capt Craig M. Heneveld, Det 5, 40 ARRS

Ranks and units are those at time of award. See MACR 900-3 for details on how to apply for your own milestone award.

Helicopter Approach Angles

Are they real or just illusions?

Figure 1. 45° true angle geometry



As Harry Reasoner said, "Helicopter pilots are different. They know that if something bad has not already happened, it is about to...." What Mr. Reasoner didn't count on, though, was the inherent ability of helicopter pilots to use their wits to stay out of trouble in the first place. Nowhere is that ability more apparent than in the approach phase of a helicopter landing. Consider, if you will, the helicopter approach angle.

Most helicopter approach procedures call for apparent approach angles of 10, 30, and 45 degrees. But are they true angles relative to some given terrain? Maybe and maybe not, but the question then becomes one of reality. Just what is the true angle of an approach?

Look at the standard VASI. Most of the time, helicopter types will see red over red all the way to touchdown while flying a "10°" angle. From just this example alone, you can see that an apparent 10-degree angle and a "real" 10-degree angle are two entirely different angles.

Similarly, that apparent 45° angle for a steep approach isn't really a 45° angle. To illustrate that explanation, look at Figure 1.

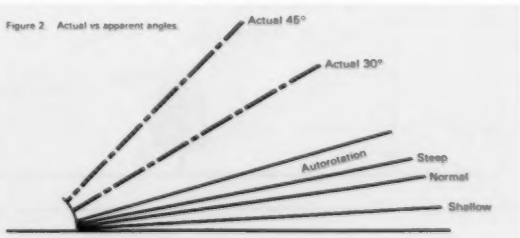
Geometrically speaking, a true 45° angle has a base/height relationship of one-to-one as shown. Now to prove that your apparent 45° angle isn't geometrically accurate, fly over a runway at 1,000 feet AGL. Have your engineer call "mark" when you are directly over one of the thousand-foot runway markers. When he does that, you look down at the *next* thousand foot marker. The angle you see at that point is a "true" 45° angle. Just from that little exercise, you can readily see that a significant difference exists between a "true" and an "apparent" 45° angle. Another way to illustrate actual versus perceived angles is to look out the side windows in a 30° or 45° bank.

What this gets back to is that the "perceived" 30° approach angle is really between 3° and 6°, and the "perceived" 45° angle is actually less than 10°. Specific numbers aren't really important (i.e., measured with a micrometer, marked with a paint brush, cut with an ax, etc.), but what is important is how you perceive a selected approach angle with regard to the terrain. That perception of "real versus apparent" is critical.

Still another way to confirm actual angles is to use the autorotational distance/altitude chart. Your helicopter has a glide angle (a fact that fixed-wing types may find hard to believe) of between 9° and 15°. The following figure shows apparent versus actual geometric angles.

The point here is that especially during marginal power operations, even the most

Figure 2. Actual vs apparent angles.



subtle terrain slope can cause misinterpretation of altitude, which in turn can cause a dangerous situation.

Visual Illusions

Helicopter pilots are creatures of "apparent" altitude and groundspeed more so than their fixed-wing counterparts. More often than not, rotary-wingers are looking out the window to maintain an acceptable altitude and, because of operating closer to the ground, are more closely attuned to apparent groundspeed. Misperception of either airspeed or altitude can cause mishaps during marginal power operations.

Look at the most critical operation for helo drivers—the marginal power approach. During a remote operation, you know that you should always start the approach at a certain altitude above the landing site. (See Figure 3)

Normally, when entering the approach, the pilot "feels" the right altitude and flies the approach without any unusual perceptions. But during pinnacle and ridgeline approaches, you're taught to ignore those feelings and fly a traffic pattern and approach entry based on a barometric altitude. But when the terrain you're flying over slopes more gradually, you may not perceive a need for such precise entry points. Look at the normal approach again.

If the terrain slopes a few degrees up or down, visual perception can be significantly affected. You can look at a 2° to 5° terrain slope and call it "flat," thinking it will be negligible during a 30° apparent approach angle. But that's not always the case.

Consider an uphill landing from 300 feet on an apparent 30° approach angle over terrain that slopes at 3°. (Figure 4). Notice that helo "A" will "feel" steep when flying an uphill approach even though the actual angle is correct. Helo "B" may feel comfy entering the approach at an incorrect altitude when the aircraft is too low. A 3° upslope will result in a 100 to 160-foot discrepancy between actual and perceived altitude. This "little" misperception results in a shallow angle and may become critical when the aircraft decelerates below translational lift and the available power margin is less than required for out of ground effect hover.

Once again, before decelerating below translational lift, you've got to ask yourself whether or not your power available is adequate to safely complete the approach. If you've got enough, then it's no sweat. If you don't, watch out! Maybe it's better to go around and try it again.

The same type of thing can happen when you're landing over a downslope, too. For instance, consider landing over a 3° downslope which, from the cockpit, appears flat. (See Fig 5). The approach angle from "B" appears normal, but the descent rate is high for the closure rate. You'll have a tendency to overarc, and also carry less power throughout the approach. This means that at the bottom of the approach, you'll find yourself too high, too slow and settling too fast. Again, with limited power available, a large power input now may be catastrophic.

The point is to know exactly how high the proposed landing site is and enter the approach at the altitude appropriate for your

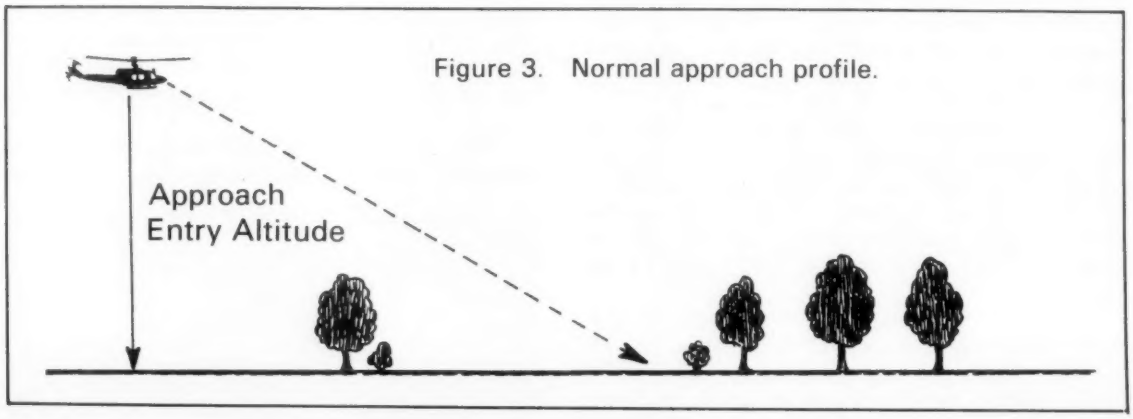


Figure 3. Normal approach profile.

aircraft whenever terrain permits. If conditions don't allow a normal approach entry altitude, beware of the effects of the visual slope illusion.

Along with all the other variables that go along with making a safe and successful landing at a remote site, visual illusions have probably taken their share of unsuspecting, unprepared victims. But as with most flying maneuvers, keeping your head out of the cockpit, staying ahead of the situation and calling on your own professional knowledge can keep you, your crew and your aircraft out of trouble.

Adapted from 1550 ATTW *Mountain Operations Student and Instructor Handout*

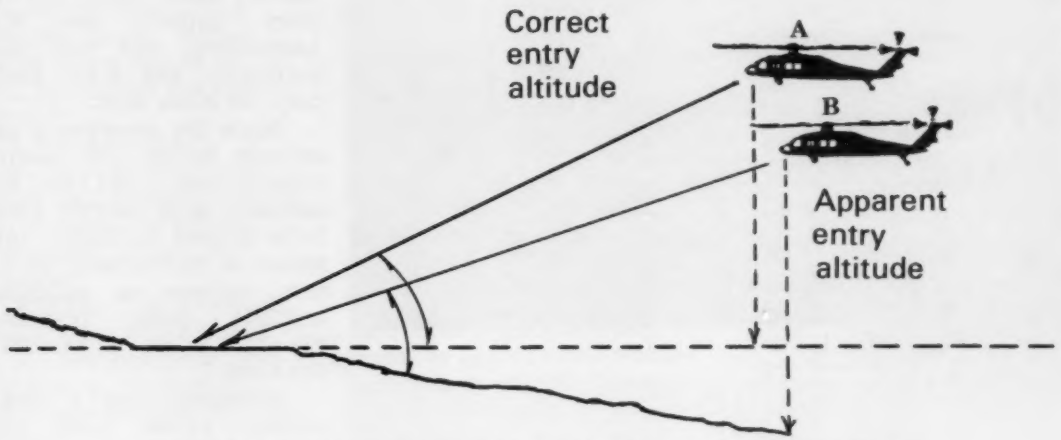
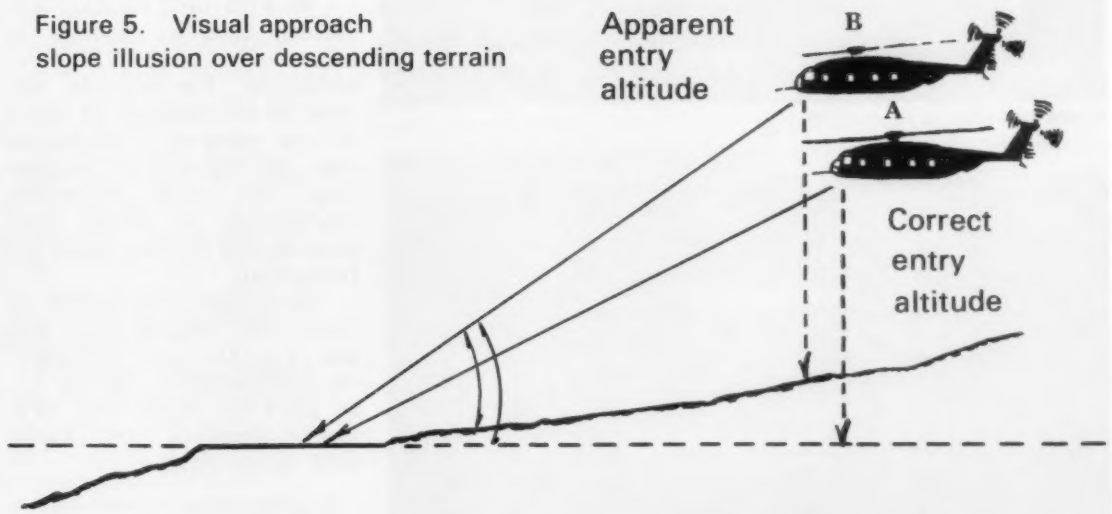


Figure 4. Visual approach slope illusion over rising terrain

Figure 5. Visual approach slope illusion over descending terrain



RAF Mildenhall, U.K.

(Elevation 33 feet)

One mile final to runway 11

On two mile final to runway 29

Short final, runway 29. A go around presents no hazards

Located in an agricultural area of southeastern England, RAF Mildenhall is 55 miles north of London. The nearest USAF-supported military airports are RAF Lakenheath, just four miles northeast, and RAF Alconbury, 25 miles west.

Since the emergency safe altitude within 100 nautical miles in only 2,700 feet, Mildenhall's local terrain offers little hazard to flight. Airspace is compressed in the area, however, so anticipate multiple radio frequency changes when approaching the field.

Mildenhall has a single runway, 11/29, 9,240 feet long and 200 feet wide, with 1,000-foot overruns at both ends. It's equipped with high intensity approach lights, runway end identifier lights, VASIs, Calvert approach lights and centerline lighting.

As with most military airfields, aircrews should be aware of current airfield restrictions. For example, circling is not authorized north of the runway. Mildenhall also has quiet hour restrictions and noise abatement procedures, so check your publications for the latest information.

Instrument approaches to Mildenhall include high and low TACAN and ILS/DME. On approaches to runway 11, be alert for conflicting VFR traffic operating from nearby RAF Lakenheath.

Adapted from AQP 51434

C.R. TERROR

The Herky Honcho Fails to Heed the Horn

Long Suffering Sam leaned on the squadron operations desk in front of the scheduling board. As he glanced at the names on the board, he noticed the name "Terror."

"You know, Blinky," he casually remarked, "I can't believe they actually sent the Boss to instructor school. Wasn't there anyone else available?"

Blinky held up his hands. "I know what you're trying to say, but the answer is the same now as it was then: Maj. Terror was the only one available."

Sammy nodded, half shrugging his shoulders at the seemingly unthinkable SNAFU. "Well, there's no doubt he had enough total time. But do you think he was really ready?" Sammy didn't get an answer to his question. Suddenly, their mentor entered the squadron, immediately spying his stalwart air-mates.

"Crimenently, Sammy m'lad!" he bellowed. "Good to see you and Blinky again," he boomed, nearly shaking Blinky's hand and arm off. "How's things been since my excursion into the world of instructordom?"

"Not bad, Boss," replied Sam. "How were things at 'the Pebble.' Did you wow them with your extensive knowledge of the Herk?"

C.R. looked semi-amazed as Sammy finished. "Why, how did you guess, Sam? I literally rolled down their socks with my encyclopedic memory of the Herk's long and illustrious history." The Fabulous Fibber immediately went to work with his hands, visually illustrating what he had "taught" the boys in the schoolhouse. Unfortunately, he was interrupted by the ops officer, Lt. Col. I.M. Tuft.

"Well, well, C.R.," Tuft smiled menacingly. "They finally let you graduate from instructor school, did they? Wasn't it two or three weeks longer than usual?" Terror nodded sheepishly.

"It was two weeks and 6 days longer to be exact, sir." The Ace of Alibis added, "You see, sir, we ran into some unfortunate circumstances and, what with the bad weather...."

"Oh knock it off, C.R.," Tuft cut him off in mid-excuse. "We're well aware of the two extra checkrides you needed, thanks to your non-standard teaching techniques." Tuft then pointed to the scheduling board.

Suddenly, the Moody Major's blood turned ice-cold as he spotted the name of the student next to his. "Oh, no!" he exclaimed. "Chandelle! That's not *Clarence* Chandelle, is it?"

"The very same," retorted Tuft. "You two even flew together once. Stalzburg, wasn't it?"

C.R. could only nod, for it was at Stalzburg that Lt. Col. Clarence Chandelle had

nearly stalled them and their trusty aircraft into the ground.

"Well, anyway, he's now your student, and I'm holding you personally responsible for ensuring that he will successfully pass his upcoming qual/tac check." The ops officer pounded the desk to emphasize his point.

"Ye...ye...yes, sir," the Stumbling Sultan of Airlift stuttered, overwhelmed at the task ahead of him. "I'll be especially careful with him, Colonel Tuft. You can depend on me."

The next evening, C.R. arrived at the squadron unusually early to examine Clarence Chandelle's training folder. Holding the bulging folder, almost as voluminous as his own, C.R. turned to the latest entries in an attempt to find his student's weak points. He didn't have to read far. Colonel Clarence Chandelle was border-line dangerous whenever he attempted a night assault landing in the venerable Herk. "No problem, there," the Herky Honcho blustered aloud. "Why, if there's anything I can do well, it's land this plane in the zone—every time."

About that time, in waltzed Clarence Chandelle. "Ahem," Clarence coughed, somewhat hesitantly. "Hello, C.R., long time no see."

"Oh, it's you, Clarence. Good to see you again," C.R. replied gamely. "Looks like you could use some work on your night assault landings."

"Astute, Major Terror. Very astute," Chandelle replied, somewhat impressed by his neophyte instructor's grasp of the obvious. "I must admit that assault landings aren't my most favorite thing, much less at night. But if I must," he sighed resignedly, "I must."

"Right," blurted C.R. "Let's get going. Times a'wastin'."

After the usual preflight perfunctories, C.R. and his student soon were droning their way through the clear night air. Amazingly, all went well as the Ace of the Assault Zone vociferously imparted all of his "IP" techniques and knowledge. But just as amazing, Chandelle seemed to soak up the knowledge, such as it was, like a dry sponge. All went well, until the command post called.

"Hanky 42, command post. The wing commander needs some stick time with an IP and you're the only aircraft airborne with an IP on board. How about making a full stop and picking him up at base operations."

"Okay, we should be down in about 15 minutes," C.R. replied, then turned to Chandelle. "Well, Clarence old boy, you've got one more chance to strut your stuff before we call it quits. Now remember everything I've told you."

"Got you, C.R.," replied Chandelle. "Flaps 50 percent and before landing checklist." Suddenly, the air seemed to come alive with radio transmissions as two night formations reentered the area for some pattern work. C.R. could barely keep his feeble faculties on the checklist, much less keep track of the radios and intercom.

"Flaps are 50 percent...." But the Inept IP could scarcely get the next item on the checklist completed before someone else bellowed in his ears. "Crimenently! Everybody's trying to talk at the same time," he snarled, hoping to get someone's attention. Turning down the radio volume control never entered his mind. "How we doing on the checklist, crew? he asked.

"Checklist complete, engineer."

"And loadmaster."

Luckily, the rest of the crew managed to complete their checklists in less time and with less confusion than the Saturated Skipper in the right seat.

"Engineer, load. Can you come back for a quick look-

see at this hydraulic leak back here."

"Pilot, engineer. I'm going off headset and check out that leak."

"Cleared as filed," retorted C.R. in a feeble attempt to get back up to speed.

"Hanky 42, Clarion LZ. Cleared for the assault zone. Report final and 100 percent flaps."

"Hanky 42," replied C.R. "Now, Clarence, remember your power and flaps. From here on out, it's airspeed and aim point, just like in the T-bird."

"Okay," shot back Chandelle. "Let's have flaps 100 percent." The right-seater deftly moved the flap lever full down as Chandelle slowed the Herk to final approach airspeed, then to max effort threshold airspeed. "Are you sure the checklist is complete, copilot?" Chandelle asked. "We don't seem to be carrying as much power as we usually do."

"Not to worry, Clarence, old boy. The before-landing checklist is complete. Now, remember. It's airspeed and aimpoint, aimpoint and airspeed."

As the *almost* fully-configured Herk was just a scant few feet from the ground, the flight engineer came back up to report his findings. His eyes nearly popped out of his head as he was greeted by a glowing red light in the gear handle which, by the way, was also in the "up" position.

"Go around, pilots. Gear!" he screamed at the top of his lungs. But his screams fell on two sets of deaf ears. If they couldn't hear the gear horn, they certainly couldn't hear his panicked warning. The next sounds on the flight deck were those of crunching metal as the Herk hit right in the middle of the assault zone, the gear safely *up* and locked!

Suddenly, the cockpit came alive with a flurry of action. C.R. tried to simultaneously push the throttles forward while fighting to keep the Herk on the assault zone. Clarence, meanwhile, was trying to pull the throttles into reverse, hoping to minimize an already bad situation. The engineer was just trying to hold on. Amid much shouting, the Herk stayed on the ground, as C.R. caged the engines and held on for a ride through the weeds. Finally, after the Herk had been stopped and shut down, the crew took the abnormally short step to the ground through the crew entrance door, and met off the nose to count heads.

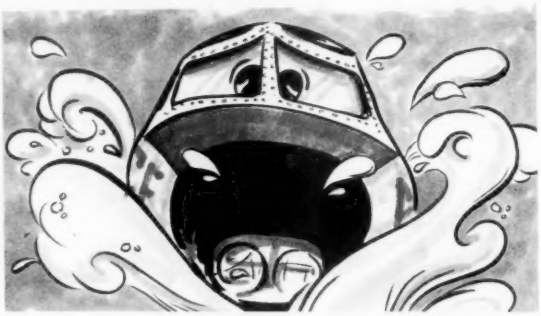
"What happened back there?" asked the engineer, his voice full of surprise. "Why wasn't the gear down?"

But before he could get either the Worried Warrior or Chandelle to answer, the area suddenly blossomed in lights—blue and red flashing ones. Brightest and fastest moving of all were the lights on top of the wing commander's car. The blue staff car came to a tire-smoking halt near the crippled '130, and Col. Fang slowly got out and walked up to the crew. As his eyes fell on the form of C.R., his face reddened and he clenched his fists in fury. Mumbling some words that sounded like "keelhaul," and "draw and quarter," he then stalked back to his car and drove away.

"What do you suppose will happen to us now?" asked Clarence, the picture of innocence!

"I don't know," replied C.R. gazing forlornly at the crippled Herk. "But I've got a feeling you and I are going to be 'copilot unqualified' for a long, long time."

Quick Stoppers



A Trip Through the Weeds

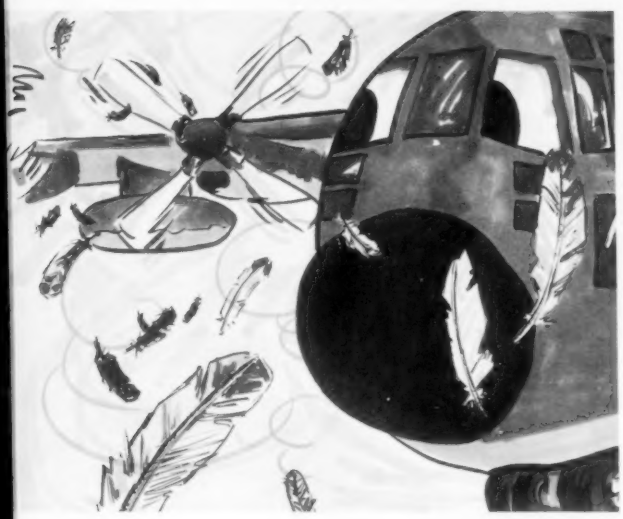
CT-39s and wet runways just don't seem to mix. Take the case of the instructor pilot and the new copilot. Prior to landing at their destination, they received two weather updates, both indicating light winds and a wet runway. Arriving on final at their destination, however, they found the winds were stronger than forecast, requiring some cross-control on landing. The pilot touched down at about 108 KIAS and 500 feet per minute. Before they could take a breath, the crew saw the anti-skid light illuminate. The pilot released the brakes, turned the anti-skid off and lightly reapplied the brakes. He also engaged nosewheel steering, but the light "flickered" two or three times before remaining steady. The mini liner was now drifting right of centerline, so the crew shut down the left engine to aid in steering and to reduce the rollout distance. And it worked—for a while, that is. With approximately 1,500 feet of tarmac left, the '39 left the runway, finally stopping about 150 feet from centerline.

What happened? Well, more than meets the eye. Seems this particular runway had some known problems, to wit, poor drainage and an uneven surface which contributed to the poor drainage. Coupled with the wind conditions, a failed antiskid system that went inop right at touchdown, tires with moderate tread wear and, not surprisingly, the runway itself, the chain of events ended with an unplanned excursion through the boonies.

A Failure to Coordinate

During a local training mission, the pilot of this Huey performed a maximum performance takeoff. Nothing unusual there. But during the max performance takeoff, the copilot called the aircraft commander's attention to the high power demand. Consequently, the pilot reduced the collective and completed the maneuver. Both pilots later stated they saw nothing out of the ordinary on the gauges.

The *next* day, however, the flight examiner flight mechanic commented that the aircraft had reached about 55 psi on the torque gauge during the takeoff, exceeding the 49 psi limit. The flight mech's student said he saw the N-1 gauge hit the redline, also. The result of this better-late-than-never testimony was that the Huey's engine was changed, and the crew ended up with a little egg on their faces for their lack of coordination.



Unfeathered Flier

The C-130 had just completed an uneventful mission and the crew was performing a static feather check of the numbers three and four propellers. But number three wouldn't feather. A quick investigation revealed why. The flight engineer discovered a piece of window glass wedged beneath the number three feather override button. Seems the copilot's window had been removed and replaced two days prior and had shattered in the process. A subsequent FOD inspection then failed to detect the piece of glass. If it's not one thing, it's another!

Extra-Efficient Rudder

Immediately after blocking out, the Starlifter pilot noticed the rudder pedals were much easier to push than normal. The scanner deplaned and reported the nose wheel movement seemed correct with both rudder pedal and nose wheel steering inputs. The pilot assumed the rudder and nosewheel steering systems were just lighter on the controls than most aircraft, and continued on with an uneventful departure.

Several hours later, the C-141 was on short final to the destination airport when the pilot applied right rudder to align the aircraft for a crosswind landing. But as he applied normal pressure to the right rudder pedal, the nose moved abruptly to the right. He quickly determined any normal rudder input resulted in much greater than normal aircraft movement.

Carefully limiting rudder inputs, the crew made a successful landing and turned the aircraft over to maintenance. The cause of the extra-efficient rudders? The artificial feel cartridge assembly and shear pin were badly worn (due to normal wear and tear), and failed sometime prior to blockout. Remember, if something doesn't feel right, there's *probably* a reason why!

Quick Stoppers

Sinus Block? In a Huey?

This is just a small illustration to show that even the "open cockpit" types have to pay close attention to their general health in order to prevent those embarrassing moments. In the back of a Huey, we find a young student pilot waiting patiently for his chance at the controls. The other pilots are practicing autorotations from about 800 feet AGL. Eventually, the pressure in the student's sinuses, especially behind his right eye, becomes so painful that the mission must be terminated. The young man is taken to see the flight surgeon. Luckily, it was only a sinus block, albeit a painful one, caused by that age-old malady of the species—the common cold. Our young student aviator was given a stern lecture, no doubt, and placed on DNIF status for four days.

Since the days of the Wrights, aircrews have flown or tried to fly with colds and cold-like symptoms. Sometimes they ended up none the worse for wear. Other times the flights ended, like this one, with an incomplete mission. Too often, cold-suffering crewmembers have ended up with ruptured ear drums and the like. Just keep in mind that if you don't feel right, don't take a chance. See the doc!

Cargo Leak? Again?

Having just arrived at an enroute stop after crossing the pond, the C-141 taxied to parking. Everything went well until the loadmaster took a post-flight look around. Back at pallet position number 13, which just happened to be on the ramp, the loadmaster discovered that something had leaked onto the cargo floor. The pallet in that position was unloaded, and the fluid, which was hydrochloric acid, neutralized with some baking soda. After a thorough clean-up, the crew and their aircraft proceeded merrily through the system.

But what caused the leak, you ask? Seems that buried in the pallet in position 13 was a five-gallon container of HCl, a.k.a., hydrochloric acid. The cap on the container was cross-threaded, apparently at the manufacturer's packaging plant, and the improperly-sealed container was not caught until the container was placed in that slanted position on the ramp.

Backwards Trim

The four-engine generic airlifter was approaching the end of the runway and the pilots were hurrying through the checklists in an attempt to make an on-time departure. But all thoughts of departure ended abruptly when the alert copilot checked the pitch trim and noticed the pitch-trim indicator was moving exactly opposite from the way it should have. Maintenance traced the problem to a faulty actuator that had been manufactured with the wiring for two cannon plugs reversed. Luckily, a sharp copilot noticed the discrepancy before flight. But what happened during the maintenance ops checks and the flight engineers' power-on preflight? Complacency? Inattention? Inexperience? Perhaps!

After Deadlines

TWO MORE MISHAPS—During the past month, two more MAC aircraft suffered extensive damage in separate mishaps. On 23 March, an HH-1H assigned to Det 7, 37 ARRS, impacted the ground during a practice 180° autorotation at Minot AFB, North Dakota. The crew suffered minor injuries, but the helicopter was heavily damaged. Then, on 5 April, a C-130E assigned to the 317 TAW departed the runway during landing at Lajes Field, the Azores. The aircraft was significantly damaged, but luckily there was only one minor injury. Both mishaps are currently under investigation.

CIVIL RESERVE AIR FLEET MARKS 32d ANNIVERSARY—On 20 March the Civil Reserve Air Fleet, better known as CRAF, began its 32d year of operations. CRAF aircraft and aircrews work in partnership with military airlift and currently provide nearly 50 percent of MAC's strategic airlift assets. That includes nearly 35 percent of MAC's total cargo capability, and 95 percent of its passenger-carrying capability. *TMF* slautes the significant contributions of CRAF, our "partners in airlift."

CRAF—NEW *TMF* FEATURE—Starting with this issue, *TMF* begins a series of articles highlighting the aircraft involved in the CRAF program and recognizing the companies who operate them. This ongoing series will feature both the history and capabilities of these aircraft, so vital to our nation's strategic mobility. What better way to begin our salute to CRAF than with the Boeing 747. Turn to page 16 to read more about the first of the "jumbo jets."

COMING IN NEXT MONTH'S *TMF*—Next month marks the 30th anniversary of this venerable publication and we plan to make it a special issue. Not only will we take a look at MAC's history, but we'll also give you the first in-depth look at the Shorts Brothers, Limited C-23A Sherpa.

***TMF* TARDY**—We Apologize for getting the May issue of *TMF* to you so late. The delay was caused by problems encountered during the printing of our April issue. These problems have since been resolved and we should be back on schedule soon.

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